



Piezoceramic multilayer actuator with a transition
region between the active region and the inactive
head and foot regions

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5 The invention concerns a piezoceramic multilayer actuator
according to the preamble of the first claim.

Multilayer actuators made from piezoceramic materials have
two-way contacting, that is to say the internal electrodes
are led out alternately at the surface of the opposite sides
of the actuator and each is electrically connected to
10 parallel at that point through an external electrode. For
electrical isolation, the head region and the foot region
consist of inactive, that is to say electrode free layers of
piezoceramic.

15 The shrinkage of the piezoceramic material, in particular in
the passive head and foot regions, is influenced by the
sintering process due to the arrangement of the metallic
electrodes and the layers of piezoceramic material.

Differences in shrinkage between regions located close to
electrodes and regions located away from electrodes lead to
20 stresses in the ceramic material, which either cause cracks
during the sintering process or act to reduce the strength
of the finished component. As a result, the susceptibility
of these components to the formation of cracks during
operation is considerably increased. Different expansion
25 characteristics of the active and of the passive region
during operation lead to stresses which favour crack
formation, in particular at the boundary between the two
regions. Cracks can be tolerated in a few applications.
However, there are fundamental problems. If the actuator is
30 not completely encapsulated, electric fields occur at the
ends of the electrodes exposed by the cracks, which can lead
to the adsorption of water or other polar

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